CLAIMS

1. A device for supporting at least one chromophoric element, comprising a substrate (2) having an upper surface (24) on which said chromophoric element (5) is fixed and means for enhancing the quantity of light emitted by the chromophoric element (5) towards a collecting device, said means forming part of a group comprising reflective means placed in the substrate at a distance from its upper surface, characterized in that this group also comprises:

- microlenses each associated with a chromophoric element and functioning in transmission or in reflection;
- diffraction means placed at a distance from the chromophoric element or elements and functioning in transmission or in reflection;
- first reflective means and second reflective means parallel to each other and placed either side of the chromophoric element or elements to define an asymmetric resonant cavity;
- a planar wave guide formed in the substrate below the upper surface carrying the chromophore or chromophores, to capture a portion of the light emitted by the chromophore or chromophores into the substrate and/or to supply excitation light;
- a configuration of the upper surface of the substrate, formed as wells with a reflective bottom and filled with a material with a suitable index each receiving a chromophoric element;
- planar resonators formed in the upper surface of the substrate;

and in that the means enhancing the quantity of light emitted by the chromophoric element or elements (5) comprise at least one of the means belonging to said group.

2. A device according to claim 1, characterized in that the substrate (2) comprises a first reflective mirror placed at a distance (d) from the upper face (24), this distance (d) satisfying the relationship $d > n\lambda/2NA^2$.

3. A device according to claim 1 or claim 2, characterized in that it comprises microlenses formed in a layer of the substrate at a distance from each chromophoric element (5) and arranged to focus the light emitted into the substrate towards the collecting device.

4. A device according to claim 1 or claim 2, characterized in that it comprises diffraction means formed in a layer of the substrate at a distance from the chromophoric elements (5) and arranged so as to diffract the light emitted into the substrate towards the collecting device.

5. A device according to claim 1, characterized in that the substrate (2) comprises a first reflective mirror (3) integral with the substrate and a second, semi-reflective mirror (7) placed facing the chromophoric elements (5), substantially parallel to the first mirror (3) and at a distance therefrom selected to define an asymmetric resonant cavity, in particular of the Fabry-Pérot type, and arranged to deliver the emitted light to the collecting device by transmission.

6. A device according to claim 5, characterized in that the second mirror (7) is formed on an entrance face (8) of an objective of the collecting device.

7. A device according to claim 5, characterized in that the second mirror (7) is formed on an entrance face (8) of a microscope observation coverslip.

8. A device according to claim 1, characterized in that the substrate (2) comprises a first reflective mirror (3) at a distance (d) from the upper face (24), this distance (d) satisfying the relationship $d < n\lambda/2NA^2$, and is arranged to receive light intended to excite chromophoric elements (5) at a non zero angle of incidence with respect to the normal (N) to the supper surface (24), said angle of incidence being selected so that there is coincidence of the field antinodes for the excitation light (λ_{exc}) and emitted light (λ), the light being collected in a direction substantially perpendicular to the upper surface (24) of the substrate.

9. A device according to claim 1, characterized in that the substrate (2) comprises an integrated asymmetric resonant cavity, in particular of the Fabry-Pérot type, placed below an upper layer, which is at least partially permeable, vertically and/or laterally, to allow migration of the chromophoric elements (5) towards sites selected relative to the resonant cavity.

10. A device according to claim 9, characterized in that said cavity is defined by two mirrors.

11. A device according to claim 9 and claim 10, characterized in that said upper layer is produced from a porous material, in particular silica gel.

12. A device according to any one of claims 9 to 11, characterized in that the upper layer comprises

holes at selected locations, to encourage migration of chromophoric elements (5) towards said sites.

13. A device according to any one of claims 10 to 12, characterized in that one of the mirrors or each mirror is constituted by a multiplicity of dielectric layers.

14. A device according to claim 13, characterized in that the dielectric layers (3) are produced from materials selected from the group formed by semiconductors, oxides, glasses, nitrides, organic polymers or organometallic polymers.

15. A device according to claim 14, characterized in that the polymers are selected from the group formed by amorphous polymers and "orientated" and birefringent polymers.

16. A device according to claim 1, characterized in that the upper face (24) of the substrate has a n-dimensional structure, n being a whole number equal to 2 or more, with dimensions selected as a function of the wavelength of the emitted light.

17. A device according to claim 16, characterized in that said structure comprises a multiplicity of parallel linear three-dimensional structures (6), selected from the group formed by channels and ribs, which are U shaped or V shaped or parabolic or elliptical in shape.

18. A device according to claim 17, characterized in that each of the tops or interstices of the parallel linear three-dimensional structures (6) can receive at least one chromophoric element (5).

19. A device according to claim 17, characterized in that at least a portion of the space separating said parallel linear three-dimensional structures (6) comprises a reflective material above which is placed a filler material with a selected index, said chromophoric elements (5) being intended to be placed on said filler material or on the tops of the three-dimensional structures.

20. A device according to claim 16, characterized in that said structure comprises a two-dimensional or three-dimensional array of holes or columns, defining a photonic crystal and resonant cavities associated with the chromophoric elements.

21. A device according to claim 20, characterized in that said photonic crystal is of the photon band gap type.

22. A device according to claim 16, characterized in that said structure comprises a multiplicity of three-dimensional wells (19), filled with a material (18) with a high index with a reflective material (20) interposed at the bottom and each being capable of receiving at least one chromophoric element on said filling material.

23. A device according to claim 22, characterized in that the configuration of the three-dimensional wells (19) is selected from the group formed by parabolas of revolution, ellipses of revolution, and n-dimensional facets, n being a whole number equal to 1 or more.

24. A device according to claim 16, characterized in that said structure comprises, for each chromophoric element (5), a planar resonator (12) capable of

storing electromagnetic energy from the field it induces and arranged so that the associated chromophoric element (5) is positioned substantially at the antinode of said electromagnetic field.

25. A device according to claim 24, characterized in that the planar resonator (12) comprises at least two three-dimensional concentric circular channels (13, 15), said chromophoric element (5) being placed substantially in the center of said channels.

26. A device according to claim 24, characterized in that the planar resonator (12) comprises a multiplicity of three-dimensional channels defining a lamellar grating, the chromophoric elements being placed substantially at the center of said lamellar grating, and said channels having a form selected from the group formed by rectangular shapes and parallel linear shapes.

27. A device according to any one of claims 24 to 26, characterized in that it comprises a planar waveguide (14) placed substantially below the chromophoric elements (5) and arranged to collect the light emitted by said chromophoric elements in the direction of support means (1) and guide it in the direction of the planar resonator (12).

28. A device according to claim 1, characterized in that said group comprises means capable of ensuring localized resonances by local reinforcement of the electromagnetic field induced by the presence of nanometric holes, which may or may not be regular, produced in selected metals, in particular in silver (Ag) or gold (Au).

29. A device according to claim 28, characterized in that said nanometric holes or structures are arranged to locally enhance emission and/or excitation, by a mechanism of the type occurring in surface enhanced Raman scattering.

30. A device according to claim 28 or claim 29, characterized in that the upper surface of the substrate (2) comprises an irregular film of silver or a multiplicity of organized silver nanostructures, said film or said nanostructures being capable of receiving chromophoric elements (5).

31. A device according to any one of claims 2 to 30, characterized in that the substrate (2) is associated with a matrix (17) of charge coupled (CCD) light detection elements, at least some of these detecting elements being capable of being electronically addressed in correspondence with at least one chromophoric element (5).

32. A device according to claim 31, characterized in that certain detection elements are associated with zones having a reference activity signal, such that a differential measurement can be carried out between detection elements (17) associated with chromophores and detection elements associated with reference zones.

33. A device according to claim 32 characterized in that, to detect the chromophoric elements (5) emitting over at least two different wavelengths, it comprises wavelength filtering means selectively associated with detection elements (17) for detecting two emitted wavelengths and for

differential treatment of exit signals from said detection elements.

34. A device according to any one of claims 31 to 33, characterized in that it comprises, between the matrix (17) and substrate (2), reflective means (3) arranged to reject light intended to excite the chromophoric elements.

35. A device according to any one of claims 31 to 34, characterized in that it comprises an absorbent layer (23) that is insensitive to the angle of incidences located between the matrix of detection elements (17) and said reflective means (3) arranged below the chromophoric elements (5).

36. A device according to any one of claims 1 to 8, 13 to 27 and 31 to 35, characterized in that the collecting device comprises a matrix (27) of photodetectors (17) arranged above the face of the substrate (2) carrying the chromophores (5) and receiving light emitted by the chromophores (5) through a filter (29) for rejecting excitation light.

37. A device according to claims 31 and 36 taken together, characterized in that it comprises two said photodetector matrices (17) placed respectively below and above the chromophoric elements (5) and associated with rejection filters (23, 29) for receiving the light emitted by the chromophoric elements over two distinct wavelengths.

38. A device according to claim 1, characterized in that it comprises a planar waveguide (14) placed substantially below the chromophoric elements (5) and arranged to collect the light emitted by said

chromophoric elements in the direction of the substrate and to guide it towards the collecting device.

39. A device according to any one of claims 1 and 31 to 38, characterized in that it comprises a planar waveguide (25) for supplying excitation light (λ_{exc}) to the chromophoric elements (5).

40. A device according to claim 39, characterized in that the planar waveguide (25) comprises, in a neutral zone of the substrate (2), a grating (26) with a low thickness modulation for coupling the excitation light (λ_{exc}).

41. A device according to any one of claims 38 to 40, characterized in that the waveguide (14, 25) comprises channels (15) close to each chromophoric element (5), said channels defining a blazed grating arranged to direct the light collected by the waveguide towards the collecting device.

42. A device according to any one of claims 1 to 41, characterized in that the chromophoric elements (5) are selected from the group formed by molecules that can emit chromophoric or chromogenic signals and semiconductor nanostructures bound to the upper face (44) of the support (1) and capable of receiving a probe (respectively a target) that can interact with a target (respectively a probe).

43. A device according to any one of claims 1 to 42, characterized in that the chromophoric elements (5) are couples comprising a target (respectively a probe) having interacted with a probe (respectively a target) integral with the upper surface (24) of the support (1).